

myself made measures of other monuments, but space fails me to refer to them now; still, I must make one exception.

We measured still another cromlech of very considerable interest, as in it we dealt with a presentation to the rise of a clock-star, and no longer to the sun. This is the remaining interior of a four-chambered barrow situated at Parc y Braose, or Parc Cwm, or the Green Combe. It was excavated by Sir John Lubbock, now Lord Avebury. The true azimuth is N. 8° E., the height of the horizon 6°. These data give us Arcturus 2600 B.C., a little earlier than the Cornish monuments with somewhat similar orientations.

It will be very instructive at some future day to compare the plans of the Castell Corrig cromlechs and that of Arthur's Stone with a view of determining the exact alignments of the supporters. I have already done this work on the plans of the Cornish cromlechs.

A study of Lukis's plans, especially of the stones still upright, brings out many interesting points, among them the fact that there were two general methods of building. One was to plant one or two stones in the exact direction of the alignment. The location of the other stones did not matter so long as the quoit was properly supported, but in many cases they were set up parallel to the directing stone, as we may call the first one erected. Another system was to support the quoit on a tripod. When this was done its greatest length was sometimes at right angles to the direction of orientation, this direction being indicated by the alignment of the single stone at one end.

It often struck me in Cornwall that the exact alignments, especially to the May-year sunrises, *which really required a knowledge of the number of days which had elapsed since the last solstice*, were the work, not of each local druid, but of peripatetic astronomer-priests who went from place to place establishing and orienting the circle and the priests' house (cromlech), and then leaving subordinate priest-druids—curates—in charge, who could not go far wrong when the alignment of both circle and cromlech fixed the May, August, November and February festivals; the solstices they could easily fix for themselves, because then the sun rose in the same place on three successive mornings.

The study of Lukis's plans shows that the work of the peripatetic priest might really have been limited in the first instance to the setting up of the single directing stone. Of course he would examine the finished work in his tours of inspection, probably at the critical times of the year—the quarter days.

I sent this suggestion some little time ago to the Rev. J. Griffith, who has greatly helped me by permitting me to draw upon his vast store of Welsh tradition. His reply really supplies us with a new line of evidence as to the tenancy of cromlechs by living men, in addition to those I have already put forward.

"I have spotted your travelling time-keeper, though I seem never to see anything until you point out what to look for. He is very conspicuous in Welsh cave legends. There is the lonely watchman—your 'curate'—waiting and waiting for him. All over the country a couplet is known as having been uttered by the 'curate.'

'Long the day and long the night,
And long it is to wait for Aaron.'

"Sometimes his name is Noah. It is clear why the pagan should have a Bible name; Aaron is the rationalised form of the name of a Welsh legendary hero—Arwn.

"In two cave legends the curate is heard exclaiming :—

'The hour is come, but the man is not.'

In one case it is the eve of New Year's Day.

"Who could the mysterious man be if not your peripatetic astronomer-priest? He was evidently very much wanted for the great festival. Your surmise or conclusion has lit up a round dozen tales I now remember, and doubtless I can find many more."

NORMAN LOCKYER.

THE INCREASED ENDOWMENT OF UNIVERSITIES.

WE are glad to see that the Press is again directing attention to the importance of an increased endowment of our universities, not so much, at the present moment, of the older universities as the younger ones. It is, in fact, the Government action in regard to Manchester University which has directed attention to the subject. That opinion is getting more enlightened is evidenced by the fact that it is now beginning to be recognised that the real gainer by such endowment as this is not any particular locality or university, but every student throughout the length and breadth of the land who is debarred by high fees from attending university courses, the university being compelled to charge high fees in order to go on at all in consequence of the absence of adequate income from any other source.

Here are some extracts from a recent article in the *Morning Post*, to take one instance :—

"It is necessary if the nation is to continue to be an independent Power to have a Navy able to defeat and destroy its rivals, and an Army able to do all such fighting, in case of war, as the Navy cannot do. But this necessity, of which no one is enamoured, does not absolve the Government from the duty of doing the very best it can for the training not only of the rank and file, but of the leaders of its population. Mr. Asquith will provide in his estimates some fifty million pounds for the needs of the Navy and of the Army. This of course cannot be reduced. For the modern universities and colleges that represent a great popular effort towards providing a better training for leaders than existed for the fathers of men now at work, and for many of those men themselves, Mr. Asquith cannot imagine that he ought to provide more than 100,000l. But this sum might be increased without reducing the other. The fifty millions are unproductive expenditure. They are mere insurance, a disagreeable necessity. But the money spent on educating young people is the most remunerative outlay possible to a nation.

"The University of Manchester is the means, in most cases the only means, open to the inhabitants of a great area in South-east Lancashire, Cheshire, and part of Yorkshire, a population numbered by millions, of obtaining an education going beyond school work. It is admittedly among the best of modern universities, with a large staff of first-rate professors, an admirable set of buildings, and an assiduous, devoted, and capable governing body. It represents the chance of South-east Lancashire providing itself with leaders in industry, commerce, the sciences, and the humanities.

"Manchester may have to compete with some place like Berlin, the centre of a comparatively small population. Berlin does not limit its Government grant to university and other forms of higher education to such a sum as ten thousand a year, therefore, and Berlin tends to eclipse Manchester in the fields of industry, trade, science, art, and the humanities.

"Mr. Asquith knows as well as anyone else how many millions such men as Sir Robert Giffen and Sir Norman Lockyer think the British Government will have to spend on universities and colleges if England is to keep her place among the nations. They may talk, but he draws the

line at one hundred thousand pounds. But does he not see that the welfare of England and her people depends above all things on their personal character and qualities twenty years hence, on the kind of men and women that she is turning year by year into citizens and mothers?"

Mr. Asquith we suspect knows more of these matters than the writer in the *Morning Post* thinks. The Chancellor of the Exchequer, in speaking at the London Chamber of Commerce in November of last year¹ said:—

"The strain of foreign competition presses upon us in every walk of business and every market in the world, and, whatever are the contributory causes of the pressure which we all in a greater or less degree experience, there is not a man acquainted with the facts who will not agree that in the case, at any rate, of some of our most formidable competitors—for instance, Germany and the United States—one of the great sources from which they have derived exceptional strength in their commercial and industrial struggle with us has been the superior development of their technical and educational system."

But it may, after all, be that Mr. Asquith is unacquainted with the methods adopted by the German Government, to take one instance, to secure this superior development. German universities are considered by our statesmen as a *quantité négligeable*; all their attention is directed to the German ironclads. This is not so in Germany, as witness the increased endowment in fifteen years of some German universities taken at random:—

State Funds.

	1891-2	1906
Berlin	107,057	161,539
Bonn	45,806	59,192
Breslau... ..	44,749	66,375
Göttingen	20,877	35,303
Greifswald	13,974	28,889
Halle	33,284	59,819
Kiel	28,188	53,072
Königsberg	39,930	57,344

The same growth of enthusiasm for higher education which is characteristic of German statesmanship is met with throughout the more densely populated eastern United States. When a comparison is instituted between the income of universities and colleges in the States in the year 1899-1900 and the income in 1904-5 (the latest year for which detailed official statistics have been published), that is fifteen years later, an enormous increase is found to have taken place. In the earlier year the total income of these institutions of higher instruction was 2,399,000*l.*, while in 1904-5 the amount had grown to 7,110,000*l.* But large though these sums are, they take no account of the generous benefactions of American men of wealth referred to later. From this source the universities and colleges received in 1899-1900 2,399,000*l.*, while fifteen years later the amount given for the spread and development of higher learning reached the magnificent sum of 3,335,800*l.* Harvard University alone received during the later year 466,000*l.*, Yale benefited to the extent of 279,000*l.*, and Columbia was enriched by 236,000*l.* Figures such as these serve better than any words to exhibit the comparative insignificance of the 122,000*l.* which, as we shall show, represents the total State endowments of English universities.

But British statesmen cannot be held responsible for the unpopularity of universities and colleges as the object in this country of the bequests and gifts of wealthy men and women. In the following table, therefore, benefactions are excluded, and the growth in the income of the universities of five important eastern States in America is given, as typical of the

advance made in the eastern half of the United States in the provision for higher instruction during the fifteen years under consideration.

Total Income, Excluding Benefactions.

	1899-1900	1904-1905
Massachusetts ...	521,800	614,000
New York	705,700	981,300
Pennsylvania	390,100	534,400
Ohio	266,600	387,000
Illinois... ..	388,800	585,800

The decision of Mr. Asquith to reduce the grant of Manchester University from 12,000*l.* to 10,000*l.* a year, we presume, is based on the stern argument that as little money as possible should be spent on the higher education; even although it is the true source of national development; it is a question, not of national, but of party politics.

In the case of party politics, of course, economy may be thrown to the winds. Mr. Haldane, when he opened the new college at Reading,¹ told us:—"The present Government proposes to spend an extra 1,000,000*l.* a year on elementary instruction, and the late Ministry spent more than that sum additionally for the same purpose, but these payments arose out of controversies which had LITTLE TO DO WITH EDUCATION."

Dealing with the modest contribution of the British Government to the universities and colleges of England, the estimates show us that in 1903 the endowment of universities amounted to 14,800*l.*, which we find increased in 1907 to 22,000*l.* In 1903 the grant to English colleges stood at 26,000*l.* This has now been increased to 100,000*l.*, we believe in consequence of the strong representation made by the British Association deputation in 1904. It is seen that at present the total State endowment of the English universities—22,000*l.* + 100,000*l.* = 122,000*l.*—is some 40,000*l.* short of the German State endowment of one university alone, that of Berlin.

We are told that to provide the "superior development of our technical and educational system," which even Mr. Asquith acknowledges is necessary to meet "the commercial and industrial struggle," we must trust to private endowment. Cambridge has recently asked for a private endowment to provide funds which the university wants at once. At the rate at which this private endowment has been coming in during the last few years, ninety years will elapse before all these funds are in hand. This is a fair sample of what private endowment does for university education in England, while the competing universities and colleges of the United States last year received nearly 5,000,000*l.* from this source,² every penny of which tended to reduce fees and extend the benefits of university instruction to a greater number of students, the peace army of a nation.

In addition to this it is important to remember that American experience all goes to show that the best results are obtained when universities are chiefly dependent on the State and not upon private generosity. It has been pointed out recently in the United States (*NATURE*, vol. lxxvii., p. 93) that as a result of the gifts of millions of dollars from great American financiers, the universities are in danger of being reckoned the purchased servants of a narrow caste. It is being urged there, as we have urged here, that it is the duty of the State to provide higher education for the people; and there is every indication that American authorities may be trusted to maintain the efficiency of their universities and colleges.

The increase in the efficiency of colleges and universi-

¹ *NATURE*, November 1, 1906 (vol. lxxv., p. 22).

² *Ibid.*, January 3, 1907 (vol. lxxv., p. 137).

¹ *NATURE*, December 6, 1906 (vol. lxxv., p. 141).

ties in this country is too pressing a need to be dependent upon party politics. Unless our statesmen can be made to realise the supreme importance of this matter and be persuaded to deal with it in a patriotic manner, generously and expeditiously, as if there were no votes to retain or secure, we must reconcile ourselves to the idea that as a manufacturing and distributing people we shall in due course have to occupy a third or fourth place among the nations of the world. In Germany, the United States, and now in Japan rulers have learnt the lesson that efficient education and industrial success are related to each other as cause and effect; and, moreover, they appear to be supported by an enlightened public opinion.

If our statesmen refuse to lead, we must make every effort to educate the voters of the country to realise the certain results of a policy of drift from which the most important of our national questions—so far as the future welfare of the British Empire is concerned—is suffering. If, meanwhile, our present supremacy is lost, it will not be because men of science have failed to warn their countrymen of the scientific spirit and energy which are yearly increasing the industrial efficiency of our great competitors.

NOTES.

ON the day of going to press we learn of the death of Lord Kelvin, an announcement which will be received with deep sorrow throughout the civilised world. To men of science, Lord Kelvin's achievements in the realm of scientific thought and discovery have long been familiar; and thirty-one years ago, in *NATURE* of September 7, 1876 (vol. xiv.), his remarkable contributions to natural knowledge were described in our Scientific Worthies series, of which he was then the subject. His death is a loss to science which only scientific workers can adequately realise. The world has to deplore the departure of a brilliant and inspiring figure; while science mourns that a leader whose influence has stimulated progress in many directions during a remarkable period has passed into stillness. For the body of one who has brought such honour to the British nation, the only appropriate place of burial is Westminster Abbey. We trust that steps will be taken at once to secure this mark of national recognition of the greatness of one who has long been regarded as the most distinguished man of science of modern times.

A LIFE of Lord Kelvin has been in preparation for some months by Prof. Silvanus Thompson, who was entrusted with this work, and to whom Lord Kelvin himself furnished numerous biographical details and other matter for the purpose. It will be published in the course of next year by Messrs. Macmillan and Co., Ltd.

THE Prince of Wales was elected an honorary member of the Royal Irish Academy at the last meeting of the academy. In the case of the election of a member of the Royal Family the election is by resolution, which was moved by the Earl of Aberdeen, Lord Lieutenant, who is the visitor of the academy, and seconded by Mr. D. H. Madden, Vice-Chancellor of the University of Dublin.

SIR NORMAN LOCKYER, K.C.B., F.R.S., has been unanimously elected president and an honorary member of the Penzance Natural History and Antiquarian Society in recognition of his services to the study of the circles and other prehistoric remains in west Cornwall.

M. EDOUARD CUYER has been elected president of the French Anthropological Society for 1908.

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Two lectures suitable for a juvenile audience will be delivered for the Society of Arts on January 1 and 8, 1908, at 5 p.m., by Mr. F. Martin Duncan, on "The Scientific Applications of the Kinematograph."

A COURSE of six lectures on the geographical distribution of rainfall in the British Isles will be given by Dr. H. R. Mill in the map room of the Royal Geographical Society on Thursday evenings in January and February, 1908, beginning January 23 at 5.30 p.m.

PROF. R. W. WOOD, professor of experimental physics in the Johns Hopkins University, has been awarded, *Science* states, the John Scott legacy premium and medal of the Franklin Institute of Philadelphia for his discoveries in colour photography.

THE Russian Physico-chemical Society has arranged to hold a conference of general and applied chemistry in honour of Mendeléeff at the beginning of January, 1908, at the University of St. Petersburg. Several discourses will be delivered on the great chemist's life and works. We learn also from the *Revue scientifique* that the journal *Russj* has inaugurated a subscription for the purchase of a Mendeléeff House, which, like the Hofmann House in Berlin, would be used for the meetings of learned societies.

THE eleventh International Congress of Navigation will be held at St. Petersburg from May 31 to June 7, 1908, under the patronage of the Emperor of Russia. The previous meetings were held at Brussels, in 1885; Vienna, 1886; Frankfurt-on-the-Main, 1888; Paris, 1889; Manchester, 1890; London, 1891; Paris, 1892; the Hague, 1894; Brussels, 1898; Paris, 1900; Dusseldorf, 1902; Milan, 1905. Arrangements have been made for communications and discussions on several questions relating to inland and maritime waterways, including the industrial and agricultural utilisation of rivers, and for scientific excursions and inspections of some of the rivers, canals, and sea ports in Russia. The address of the general secretary of the congress is 7 Ismailovsky Prospect, St. Petersburg.

THE current number of the *Revue Scientifique* contains an account of "La Caisse des Recherches scientifiques." The fund was founded by law on July 14, 1901, on the proposition of M. Audiffred, with the double object of assisting medical science in its researches and of providing financial assistance to original workers in pure science. The fund receives from the French Government an annuity of 5000*l.*, and at its inauguration M. Audiffred gave 2400*l.* The idea of the fund has not proved altogether popular, for in 1906 the Caisse des Recherches received general donations to the extent only of just under 200*l.* But there has been considerable improvement this year, and it is anticipated that the amount will be much larger; the Paris Municipal Council itself gave 200*l.*, and several general councils have given small sums. Since its creation the Caisse has distributed more than 24,100*l.*, of which about 1000*l.* only was available for work in other than medical and biological science. M. Rigaut may well say that these sums are wholly inadequate so far as the needs of science are concerned.

PROF. ASAPH HALL, whose death we announced last week, will always be remembered as the discoverer of the satellites of Mars, since the sensational character of the discovery appealed powerfully to the public mind; but in many ways he accomplished much useful work in every department of astronomy, and exhibited an industry which placed him in the forefront of American astronomers.